VOLVO

Volvo is proud to present the first production series Volvo P 1800 sports coupé cars.

Many Volvo customers all over the world have been inquiring for some years as to whether Volvo could design and produce a sportier car based on the mechanical assemblies included in the other car models. Volvo has now fulfilled this request and the result is the Volvo P1800.

The styling of this car has been carried out by Frua in Italy. We consider that the P 1800 is a handsome car and we also believe that its design will remain modern for some considerable time. Its lines show much of the Italian style which has been regarded on many occasions as setting the fashion for the car industries of the world.

Unfortunately Volvo did not and still does not have the resources to build and assemble the bodywork in its own factories in Sweden. For this reason, Volvo contacted The Pressed Steel Co. Ltd., one of the leading body manufacturers in England and this company agreed to build the bodies. At the same time agreement was reached with the well-known British motor firm, Jensen Motor Ltd., in West Bromwich, who undertook to assemble the complete vehicles, this work being now in full swing.

Volvo supplies all the mechanical components such as engines, radiators, gearboxes, rear axles, brakes, steering systems, etc., so that all these parts have already been subjected to severe testing in Volvo cars over a period of some years.

As far as the technical data is concerned, we refer you to the enclosed brochure. It should be pointed out that the engine is a completely new and specially designed four-cylinder unit with an output of 100 b.h.p. (SAE) and a hardened crankshaft carried in five bearings. The compression ratio is 9.5:1 and 97 octane fuel should be used. The gearbox is a four-speed special for sports cars. Optional extra equipment includes an electrically-operated overdrive. The propeller shaft is of the divided type mounted in rubber blocks for insulation from sound and vibration. Vacuum-servo footbrake system. The front wheels

are fitted with three-cylinder disc brakes with easily replaceable pads. The rear brakes are V-type drum brakes. The car is fitted with 15" wheels and sports type braced tread 165 - 15" tires. The electrical equipment is of the 12-volt type.

Instrumentation is very comprehensive and includes not only standard warning lamps and instruments, but also a speedometer with both mileometer and trip-meter, revolution counter, water and oil temperature gauges, oil pressure gauge, fuel gauge and clock. There are also twin horns with a specially operated loud tone horn.

This car will be available in three different colours: red, white and grey. The white and grey cars have red upholstery with black mouldings and trimmings. All internal appointments are very tastefully designed. The dashboard and sun vizors are padded; the seats are extremely comfortable and can be adjusted for individual requirements. Luggage accommodation is particularly spacious compared with other sports cars. In common with other Volvo cars, the P 1800 is fitted with safety belts, electric windscreen wipers and electric windscreen washers.

Delivery has just started from the assembly plant in England and the rate of production will gradually increase up to 150 vehicles per week. The P 1800 will be sold on most of the markets where Volvo is represented.

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Technical description of the P 1800 with the exception of the engine.

The basic idea was that this car should be a sports coupé rather than a racing car. This means that it can be considered as being a complement to our car range.

We have maintained standard car comfort, i.e. resilient suspension, good sound insulation, draught-free design and a liberally dimensioned heater with a special fresh air system at the same time as the new engine has given the car an excellent performance and outstanding road-holding through design features specified under the heading "Chassis".

Power transmission

The gearbox is the same four-speed unit with designation M 40 as used in our other car models.

The gear ratios are thus exactly the same, the only difference being that all the forward gears are carried in needle bearings. This is a constructional detail which is usually limited to pure sports cars and is motivated by the considerably higher average speed maintained by such cars.

The car is available in two models, one with the M 40 gearbox and a rear axle ratio of 4.10:1 known as the P 18394 A and the other with the M 41 gearbox (four-speed plus overdrive) and a rear axle ratio of 4.56:1 known as the P 18395 A.

The most interesting alternative is undoubtedly the car fitted with overdrive. It can be considered to have five speeds, the four normal ratios being used for acceleration and the fifth gear as a "cruising gear". A point worth remembering is that the overdrive is operated electrically. It is extremely easy to engage since the clutch does not need to be used.

Naturally the model with overdrive runs more economically from the point of view of fuel consumption. For example when running at a steady speed of 60 m.p.h., fuel consumption is as low as 40 miles per gallon. The fuel consumption of the P 1800 is otherwise even lower than that of the 122 S on condition that the same output is utilized. Since P 1800 is faster and delivers a larger output, it can be said in general that fuel consumption is the same as that of the 122 S.

The gear ratios on the P 1800 have not been determined in order to produce the highest possible speed but rather the best possible acceleration.

The maximum speed of the car is thus rather more than 106 m.p.h. and the acceleration time from 0 - 62 m.p.h. is slightly more than 13 seconds with two passengers.

Speeds

P 18394 A = M 40 (rear axle ratio 4.10:1)
Direct gear 5500 r.p.m. = 96 m.p.h.

P 18395 A = M 41 (rear axle ratio 4.56:1)
Direct gear 5500 r.p.m. = 87 m.p.h.

CHASSIS

Most of the chassis components are those used on the 121 - 122 S. This means coil springs all round as well as the special Volvo rear axle suspension, i.e. the rear axle is located by special support arms and a track bar in connection with coil springs and shock absorbers which are of a special type embodying a freon-filled nylon cell so that they stand up to high temperatures without sacrificing any of their damping qualities.

We have found that a suspension system of this type where the various functions are taken care of by special units is considerably better than a system including, for example, leaf springs which function as locating, springing and damping organs. From the point of view of maintenance, Volvo also considers the P 1800 suspension system to be superior to a conventional suspension.

Compared with the 121-122 S, the P 1800 has a shorter wheelbase, 96 1/2" instead of 102 1/2",
the centre of gravity is lower,
front end stabilizing has been intensified,
spring constants and shock absorber
travel have been modified for the
special tyres fitted.

These tyres are of the "belted" or "radial ply" type.

When a tyre is subjected to stress, for example lateral stress when taking curves, it is deformed. Deformation in a normal tyre is taken up by the tread which is relatively soft compared with the stiff side-walls. Since the tread is deformed, it does not have perfect contact with the road surface.

Belted tyres function the opposite way in principle. If a belt is incorporated beneath the actual tread, this braces the tread and makes it very stiff while the deformation is taken up by the considerably softer tyre side-walls. The result is a larger and better contact area with the road surface which means that greater stresses are absorbed when cornering, accelerating and braking. In addition to this the tyre has a longer life and tyre squeal during cornering is almost eliminated.

There is one disadvantage, however, since this type of tyre results in hard running at low speeds but through the spring and shock absorber system mentioned earlier we have succeeded in making the P 1800 comfortable to drive at low speed and, we venture to mention, outstandingly smooth to drive at high speeds.

Through these design modifications and by allowing for these special tyres, we have managed to produce road-holding which has even surprised us.

The most important new feature on the chassis otherwise is the disc brake equipment.

The design of disc brakes is fairly well known by now and a characteristic feature of these brakes is their excellent cooling compared with drum brakes. This can be noticed by braking a couple of times when you are driving fast: retardation is about the same at 90 m.p.h. as it is at 30 m.p.h. But this improved cooling or greatly decreased tendency to brake fade becomes more obvious in the case of repeated braking.

A further property of disc brakes is that they permit a greater range of pedal pressure. In other words the degree of retardation obtained is directly proportional to the pressure applied to the brake pedal.

The P 1800 is fitted with a servo brake system to keep the required brake pedal pressure range very low.

This car will also be in the hands of women drivers and one cannot expect them to exert colossal pressure on the brake pedal.

BODY

We have attempted to give the P 1800 body lines that will remain modern for some considerably time. This car has the classically soft sports coupé lines and we have tried to avoid incorporating features subject to passing fads.

The form of the P 1800 can be regarded as being somewhere between the block design of yesterday, the "trapeziod line" (Fiat 1800) and the rounded style of today (Ford). The body is naturally of the integral construction type.

The interior appointments are smart and well in keeping with the style of the car. Instrumentation is very comprehensive and includes both an electric revolution counter and an oil temperature gauge. There is an extra lever to the right under the steering wheel. This operates a special loud-tone horn for highway driving while the normal horn button is located in the centre of the steering wheel as usual.

We have attempted to design the seats so that they provide a comfortable and firm position but we have deliberately abstained from an exaggerated concave form. We do not believe that concave design can be carried out effectively if it is to fit people of varying shapes and sizes. If it is to be effective, it must be "tailor-made" for individuals. Instead we have gone in for a firm driving position even when cornering at high speed, i.e. with a good support for the left foot. This support is exactly at the same distance from the seat as the accelerator and its inclination corresponds to about half throttle.

Safety has naturally taken a primary place in the design of this car. Standard equipment includes safety belts and there is plenty of legroom under the dashboard. A safety belt must have a certain amount of flexibility if it is to function properly in the event of a collision - the passenger in question is thrown forward and there must be enough room for the legs to move forward without being injured. In addition to this, the dashboard and sun vizors are, of course padded.

By way of summary it can be said that the P 1800 is a car in which saloon car comfort has been retained in all respects while, at the same time, it has an extremely fine performance and outstanding road-holding.

VOLVO

Information about the B 18 B sports car engine

On October 12th 1957 the management of Volvo called a conference with the engine design office and the technical director mentioned the demands to be made on an engine for the P 1800 sports car which was then in the planning stage. The requirements mentioned included higher output than the B 16 B sports engine, a minimum increase in weight and naturally, low manufacturing costs.

In order to satisfy the condition concerning a minimum increase in weight, there was later discussion during the preliminary designing stage about the use of light-alloy for component parts not subjected to intermittent loading. The result of this was that certain parts such as the timing gear casing, flywheel housing, oil pump, water pump and other small parts were planned in light-alloy and finally manufactured of this material, some die-cast. This meant that the anticipated weight increase of 8 - 10 kg (17 - 22 lb.) could be reduced to merely a couple of kg.

The requirements made concerning the speed of the car, acceleration, etc. gave an engine with the following data:

Engine type	B 18 B
Bore	84.14 mm (3.312")
Stroke	80 mm (3.15")
Number of cylinders	4
Capacity	1.78 litres (108.6 cu.in.)
Output	100 b.h.p. (SAE) at 5,500 r.p.m.
Output/litre	56 b.h.p. (SAE)
Torque	15 kgm (108 lb.ft.) at 4,000 r.p.m.

The amount of designing work behind this engine can be shown as follows:

Specification and performance requirements	approx.	1650 man/hours
Test engine model	"	9000 "
Follow-up to production stage	"	10000 "

i.e. a total of more than 20,000 hours of design work.

This does not imply by any means that all design work is thus completed since follow-up work and modifications resulting from experience acquired will naturally continue as long as this engine is in production. We have naturally carried out exhaustive investigations of the experience obtained from our very successful B 16 B engine.

As far as design details are concerned, we should particularly like to mention the following:

The crankshaft is carried in five main bearings with a diameter of approx. 63.5 mm (2 ½") and the diameter of the big-end bearings is approx. 54 mm (2 1/8"). All the bearing journals are hardened and the bearing shells for both main and big-end bearings are in the form of indium-plated, lead-bronze units with steel shells. This sturdy and liberally dimensioned crankshaft can stand up to the high level of loading resulting from hard driving with a high compression ratio. The very slight degree of deformation resulting means that the engine runs quietly and steadily.

As is customary for this type of engine, the pistons are of light-alloy with integral steel reinforcement for constant piston clearance and good adaptability for various conditions of loading. Each piston has two compression rings, the upper of which is chromed and makes a valuable contribution to low cylinder wear. Each piston has also one oil control ring. Due to the anticipated greater degree of loading, the gudgeon pins have a diameter of 22 mm (0.87").

The cylinder block is of cast-iron with robust flanges for the flywheel housing and starter motor, particular attention having been devoted to the fact that the engine is designed for high-speed running. For this reason the flywheel housing, which is of light-alloy, is of tapered design to provide the necessary rigidity even when it is loaded with extra weight of the overdrive in addition to that of the normal gearbox.

The cylinder head is also made of cast-iron with four ports on the induction side, these being fed in pairs by the twin carburetters,

which are SU 1 3/4" HS-6 units. The combustion chambers are fully machined so that even when using 97-octane fuel with the compression ratio of 9.5:1, there is neither knocking nor misfiring due to glow ignition. Since the cylinder head has cooling channels round the spark plug holes, there is a large range of tolerance concerning the spark plug heat range.

The water pump supplies cooling water directly to the cylinder head where a distribution tube ensures that the hotter parts of the cylinder head are effectively cooled. The cooling water in the cylinder head then passes down into the block where relatively rapid heating in combination with a thermo-syphon effect causes it to rise up to the upper part of the block from where it returns to the radiator through the thermostat. It is possible that this effevtive cooling of the cylinder head and the walls of the combustion chambers makes an active contribution to the absence of knocking and glow ignition mis-firing. It is also known that the rapid heating up of the cylinders contributes actively to a low rate of cylinder wear.

Lubrication oil is fed to the bearings from a gear type oil pump, all the oil being very effectively cleaned in a full-flow filter. In order to avoid churning and foaming of the lubricating oil in the sump as much as possible, the oil system relief valve is located in the oil pump housing whereby the oil passing through this valve on the pressure side of the pump is returned directly to the suction side and not fed back to the sump as is often the case. On certain markets where air-temperatures are high and the car is run at full speed for several hours, there is always risk of the oil temperatures becoming excessively high. For this reason the engines is fitted with a water-cooled oil cooler which decreases oil temperature by 20-30° C (35-55° F). While the engine is being run warm when air temperatures are particularly low, the oil cooler can also function as an oil warmer so that the oil attains its working temperature more rapidly.

For those who are interested in studying the behaviour of the engine, there is an electric revolution counter connected to the distributor. This revolution counter is of transistorized design and is connected directly by means of an electrical lead to the dial in the instrument

panel. The revolution counter dial has a red field over 6000 r.p.m. and shaded markings between 5500 and 6000 r.p.m. Generally speaking, it can be said that under 5500 r.p.m., the engine has its normal "motorway speed range" while the shaded field is a reminder that the engine is approaching the range between 6000 and 7000 r.p.m. where irregularity can be expected in valve operation.

We are convinced that this engine is a fine example of Volvo quality.

VOLVO

Re: Test programme for the P 1800

By Åke Larborn, Chief of the Volvo Development Laboratory - a short survey of the development work on the engine and car.

ENGINE

As early as 1957 when the B 16 engine went into production, preliminary studies were started on a B 16 engine with the crankshaft carried in five bearings. A little later B 16 engines were made with a greater bore so that the capacity was increased to 1.8 litres. These first experiments paved the way for the prototypes of the B 18 engine which were completed in 1958 and subjected to an intensive test programme.

Up to the commencement of production, we have used 40 prototype engines which cost one million Swedish Kronor to build, i.e. each prototype engine cost about 25,000:- Sw.Kr.

During these years many thousands of hours of wear tests have been run on the test beds in addition to purely functional tests. At the same time some engines have been road tested over a total distance of almost 1 million km (620,000 miles).

The main part of the test work has been concerned with the combustion chambers with a high compression ratio of 9.5:1, the function of the valve system at high engine speeds, the five-bearing crankshaft and a very effective water-cooled oil cooler.

It has been found that the 97 octane premium fuel generally available in Sweden causes no combustion troubles with the compression ratio in question. Engines have also been placed at the disposal of certain oil companies for laboratory tests which confirmed our results and the oil companies have also been able to carry out tests concerning the properties of future engines. As anticipated, the five-bearing crankshaft has resulted in extraordinarily quiet running and also provides the possibility of using considerably higher compression ratios in the engine without any mechanical problems, should this be desirable in the future.

The oil cooler has been designed so that even in the case of continuous top speed driving the oil temperature never attains excessively high levels. The oil cooler also means more rapid warming up of the oil during town driving in very cold weather and this, in its turn, counteracts sludge formation in the oil.

THE CAR

Experiments with the car were started in 1959 when a test programme extending over several months was carried out on specially selected roads in South Germany. At the beginning of 1960, a corresponding team of test engineers was sent over to England to start tests on the first British prototypes. Much of this test work was carried out on the British car industry proving ground (MIRA). All the required functional tests were carried out as well as body strength endurance tests on the special MIRA rough track. The British body-builder, The Pressed Steel Co., could follow up these test results directly and carry out corresponding reinforcements on the body.

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During the spring of 1960 further prototypes were sent to Sweden where further test work continued. It was shown that the MIRA endurance tests had been very reliable since no body strength problems appeared during the intensive endurance testing carried out on Swedish roads.

Other problems which have received special attention have naturally been material properties, engine cooling, heat conduction, disc brakes, etc. Disc brakes were studied particularly from the viewpoint of the effect of dust and gravel from dirt roads and it was found necessary to fit special shields for the brakes to ensure a satisfactory length of life for the pad facings.